

Over time, consistent hardware defines intuitive interaction...

**CONSISTENCY in
CROSS-DEVICE NAVIGATION**
Doing it with XEEL

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<http://innovate/xeel>

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Windows Hardware Experience Group

2004 Hard/Soft Interaction Fundamentals

- » Power & Security Buttons, Biometrics
- » RTC – Annotation, Telephony, Meetings
- » Notifications, Indicators, Aux Displays
- » **Navigation**, Media Transport, Remotes
- » Multi-Mon, Tablet Docking, HIDs
- » Portable Personal Storage



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XEEL Overview

Tablet PC, Mira, eHome, Pocket PC, SmartPhone, Zenith require dedicated buttons for info nav & media consumption.

Cross-product consistency provides:

- » usability & productivity benefits
- » signature -> MS market advantage

Scenarios

A Tablet PC user reviews a report that was distributed in a meeting. Then, in an inconspicuous way, reads her email during the presentation without touching the screen with her stylus...

On the bus, a Zenith user scans news headlines on his watch wondering when the market is going to recover...

At home, a Mira user sits on his couch with one hand resting on his golden retriever and surfs the New York Times on the web...

Standing in line at the coffee shop, a SmartPhone user retrieves a client's phone number and calls to confirm that the parts arrived on time...

In an 8'x12' dorm, an eHome user browses her music collection with a remote control and chooses a playlist that inspires...

A shopper in a computer superstore picks up a new Microsoft device and immediately knows how to use it...

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Opportunity

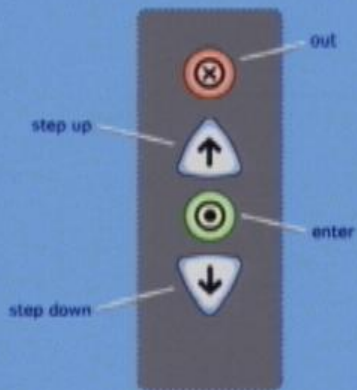
Casio defined what became “intuitive” wristwatch user interfaces in the late 70’s and early 80’s for generations of timepiece wearers.

We have a similar opportunity to define what could become intuitive for people who regularly use multiple Microsoft products in the span of their daily lives.

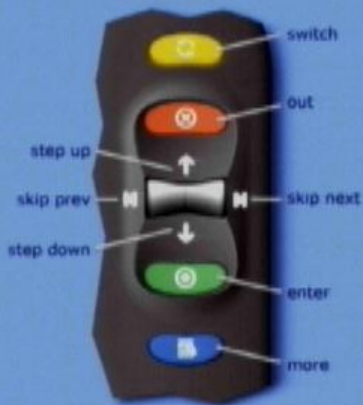
Framework

- Two overlapping cross-product hard/soft user experience initiatives:
 - » **Cross-UX Signature Task Force**
 - » **Cross-UX Wheel (XEEL) Task Force**
- Both groups involve participants from multiple disciplines across divisions.
- Target rollout in the Longhorn/Office 2004 “better together” timeframe, and therefore believe we need to have hardware spec’s complete by Sept/Oct 2002. Schedule and priorities roll back from there.

Functional Snapshot



Bare Minimum Set



Full Navigation Set
(preferred embodiment)

Program Goals

- » small set of easy to use hardware-based software controls for navigation and information consumption
- » scale across all important applications, key media types and data contexts
- » scale to fit all Microsoft device platforms & form factors
- » build on success of mouse wheel, map to a variety of hardware switch & controller types
- » reliable & consistent implementation across Microsoft platforms
- » reliable & consistent implementation by leading software apps
- » reliable & consistent implementation across hardware platform types by leading Microsoft device OEMs & ODMs

Non-Goals

- » not a replacement for random-roam devices, such as mice and styli
- » not designed to accommodate content creation and data production
- » not intended to support competing OS platforms running on similar or identical hardware (i.e. the hardware/software combination is critical)

Business Justification

- » participants learned to use XEEL quickly and saw its advantages
- » participants judged the pen & XEEL combination on tablet devices as highly useful
- » people seem willing to pay more for a tablet with dedicated hardware navigation controls
- » mapping not hardware specific (enables OEMs to compete on hardware implementations for market differentiation while safely providing a consistent user interface across brands)
- » providing a common navigation signature across Microsoft platforms may increase the cross-sell from one Microsoft platform to another
- » about 80-90% ready today with existing or forthcoming pre-Longhorn software and devices. What's needed most are:
 - » Cleanup of non-compliant key event mappings in Windows and Office;
 - » Evangelism to each division's respective hardware OEMs & ODMs for Longhorn timeframe form factors.

Value Proposition

- » first native interface that spans from full-strength computers to mobile phones to handheld computing devices to wrist watches to home entertainment systems
- » customers won't have to learn or remember interaction idiosyncrasies of each technology; enabling them to be
 - › more productive in their work
 - › more engaged in the substance of their lives

Cross-Product Scalability

	Single screen devices without cursor control		Single Pane UI w/o cursor	Multi-Pane UI w/optional cursor control	
Generic XEEL Term	SPO - Zenith (wristwatch)	Stinger (smart phone)	eHome (10' remote)	Mira v?	Tablet PC v2
STEP UP	PREV	UP	UP	UP	UP
STEP DN	NEXT	DOWN	DOWN	DOWN	DOWN
SKIP NEXT	-	RIGHT	RIGHT	SKIP NEXT	SKIP NEXT
SKIP PREV	-	LEFT	LEFT	SKIP PREV	SKIP PREV
ENTER	ENTER	OK (soft key)	OK	ENTER	ENTER
OUT	CHANNEL	BACK	BACK	OUT	OUT
MORE	-	(soft key)	DETAILS	MORE	MORE
SWITCH	-	HOME	GUIDE	SWITCH	SWITCH

Requirements

Priority 1:

- » User can **STEP** (Up/Down) through options within a single interface context
- » User can take immediate action on (**ENTER**) items in the current context
- » User can exit **OUT** from the current context

Priority 2:

- » User can **SKIP** (Next/Previous) among locally visible interface contexts or content chunks

Priority 2 or 3 *(depending upon device class)*:

- » User can **SWITCH** among application windows or channels
- » User can get **MORE** detail about, or take secondary actions on, the current item in focus

Priority 3:

- » On a wheel-like control device, continuous or rolling **STEP** (Up/Down) interactions benefit from acceleration curves and high-resolution translation, flick gestures

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Dependencies

Partner Support

- » Continued cooperation across divisions and product groups to develop and refine this specification
- » Commitment to dogfood and modify system and/or application behaviors to work with either default key event mappings or new AppCommands
- » Evangelization to ISVs, OEMs, and ODMs starting in October 2002 to meet Longhorn timeframe deliverables

Platform Support

- » Establish new AppCommands to address special cases where default key event mappings fail

Xeel User Research Program

Three studies have been completed

- » Study 1 / Proof of Concept
- » Study 2 / Xeel + Pen
- » Study 3 / Xeel Form Factors

Method was similar across all studies

- » Common/frequent tasks (e.g., email, Word, IE)
- » Within-participant design

Primary issues addressed were:

- » Usefulness across MS applications and OSs
- » Ease of use and learning
- » Optimum button set
- » User preferences
- » Uncovering inconsistencies in MS software

Test 1 Setup

Button-style Xeel only.

Three function mappings compared.

- » Minimal
- » Modal
- » Less Modal



Control / Function Assignments

Control / Function Assignments		
Minimal	Modal	Less-modal (with Wheel)
Up / Down	Up / Down	Up / Down
Enter	Enter	Enter
Out	Out	Out
	Skip Prev, Skip Next	Skip Prev, Skip Next
	More	More
		Scroll

Goals of Study One

- Determine the optimum number of controls and functions for a tablet or PC
- Compare more buttons / less modal to fewer buttons / more modal
- Assess ease of learning, usefulness

Example of modes - Behavior of Up/Down buttons depends on software context:

- › arrow up/down
- › scroll up/down
- › page up/down

Methodology for Study One

Performed a series of tasks using *only* a Xeel for navigation on a Tablet PC (in Tablet mode)

Sample tasks -

- » Navigate Outlook Inbox
- » Open email
- » Browse web

Navigation elements encountered (sample)

- » Lists
- » Panes
- » Documents
- » Links

Highlights of Findings for Study One

- Highly successful in navigating with all three versions
- No differences in subjective ease-of-use or ease-of-learning
- Minimal configuration is not rich enough for Tablet or PC
- Despite extra modality load, the Modal version was preferred
- Modal buttons increase learning time, but appear not as significant a hurdle as inconsistencies among / within applications

Study Two: Xeel + Pen

Goals:

- » To explore the use of Xeel and pen together in a Tablet environment
- » To assess success with additional navigation elements
- » To compare two form factors: buttons vs. 4-function wheel

Method:

- » Similar to Study One
- » 5 conditions: pen, button, wheel, pen+button, pen+wheel

Study Two: Xeel + Pen

Xeel w. 4-Function Wheel



Button Xeel

Results

Pen w. Xeel and Pen alone judged equally highly useful

All were judged easy to learn,
Pen slightly easier to learn

The majority described the combination as very effective, playing off the advantages of each

User expectations matched navigation spec's, even when not supported by existing software, such as 1-D hierarchies and 2-D grids

Left-Handed Use Allows Bimanual Control



Pen scrolling obscures content,
but Xeel scrolling does not.

Study Two: Xeel + Pen

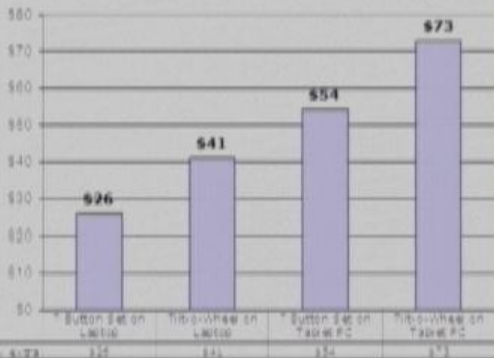
Xeel w. 4-Function Wheel



Button Xeel

Study Two: Relative Value

How much would you pay for Navigation Controls on your next purchase of a Laptop or Tablet PC?



- People willing to pay for Nav Controls, even w/keyboard present
- Nav Controls on a Tablet valued **2x** as much as on Laptop
- Wheel valued **1.5x** as much as Button-Set

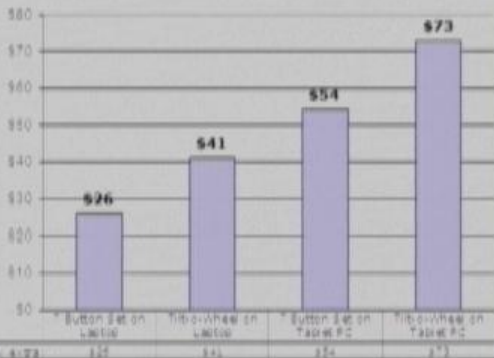
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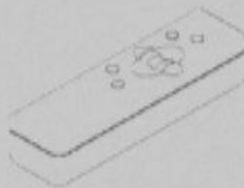
Study Three: Form Factors

Goals

- » Compare three different form factors for the Xeel
- » Explore usage while in a “mobile” context or “casual” posture
- » Extend usage to more navigation elements

Two of the Xeels Used in Study Three

Wheel with side switches



Xeel with wide-roller

Study Three: Form Factors

Results

- » Poor ergonomics of rough prototypes resulted in invalid comparison among the three models
- » Prior success with varied navigation tasks was replicated
- » Function mappings & modalities confirmed

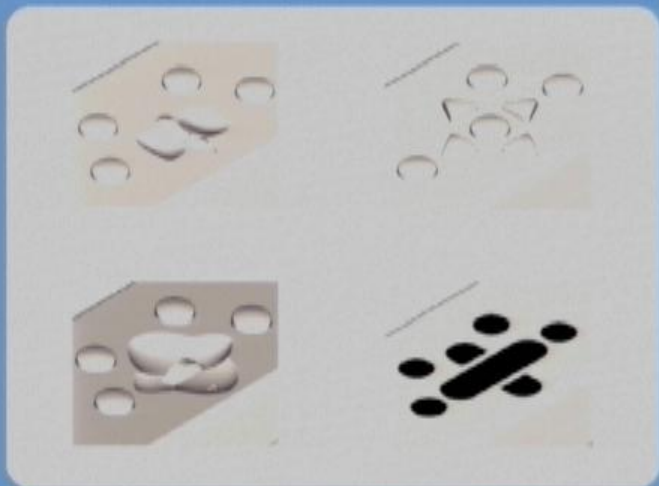
What Works Well (Examples)

- Outlook
 - » Tabbing among panes
 - » Scrolling through message list
 - » Scrolling through messages
 - » Opening, closing messages
 - » Task Pad hierarchy
- Internet Explorer
 - » Wheel for scrolling
 - » Wheel with pen is natural combination
 - » Back button
- Word
 - » OK for reading (scrolling w/pen hard)
- OS
 - » File Browser
 - » Opening, closing files & folders
 - » File & folder tasks

What Needs Work – Inconsistent or Impossible (Examples)

- Hierarchies
 - » Folder list in Outlook
 - » Directory tree in File Explorer
- Outlook
 - » Cannot open attachments
- Internet Explorer
 - » Tabbing is cumbersome
 - » Hard to see focus while tabbing
 - » Cannot scroll horizontally (OK)
- Word
 - » Not great for editing (OK)
 - » Non-destructive mappings & reading mode needed
- File Browser
 - » Cannot go right in tile grid view (need autowrap)
 - » OUT: back historically v. up hierarchically confusing

Study 4 to evaluate ergonomic performance...



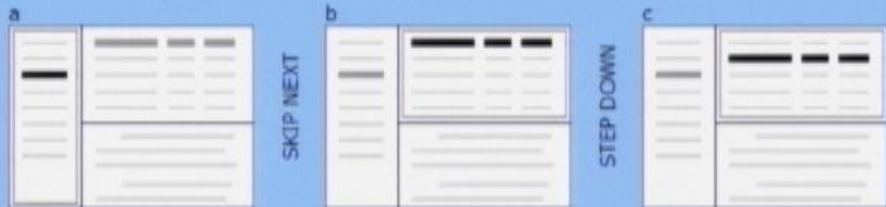
Multi-Paned Windows



examples:

- » Outlook with mailbox hierarchy and preview pane
- » Shell file browser with task & detail pane
- » Start menu with Desktop & Sidebar

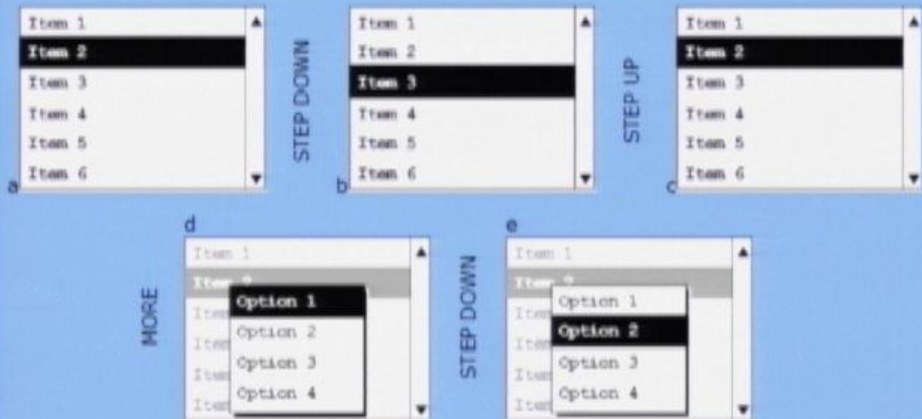
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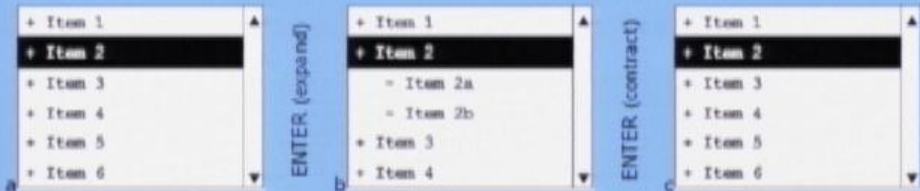
One Dimensional Arrays



examples:

- » Shell file list
- » Outlook mail message list
- » Drop down menu

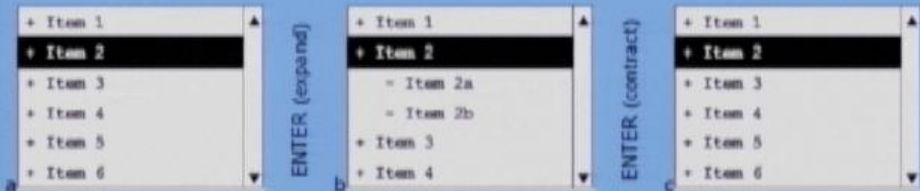
Hierarchical Lists



examples:

- » Shell file explorer directory tree
- » Shell file browser task & detail pane
- » Outlook mailbox tree
- » Outlook task pad

Hierarchical Lists



examples:

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- » Outlook task pad

Two Dimensional Arrays

a

My Schedule						
**** Aug 2002 ****						
Su	Mo	Tu	We	Th	Fr	Sa
	1	2	3	4	5	
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

STEP DOWN

b

My Schedule						
**** Aug 2002 ****						
Su	Mo	Tu	We	Th	Fr	Sa
	1	2	3	4	5	
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

SKIP NEXT
(right)

c

My Schedule						
**** Aug 2002 ****						
Su	Mo	Tu	We	Th	Fr	Sa
	1	2	3	4	5	
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

a

01	09	17	25	33
02	10	18	26	34
03	11	19	27	35
04	12	20	28	36
05	13	21	29	37
06	14	22	30	38
07	15	23	31	39
08	16	24	32	40

STEP DOWN

b

01	09	17	25	33
02	10	18	26	34
03	11	19	27	35
04	12	20	28	36
05	13	21	29	37
06	14	22	30	38
07	15	23	31	39
08	16	24	32	40

STEP DOWN

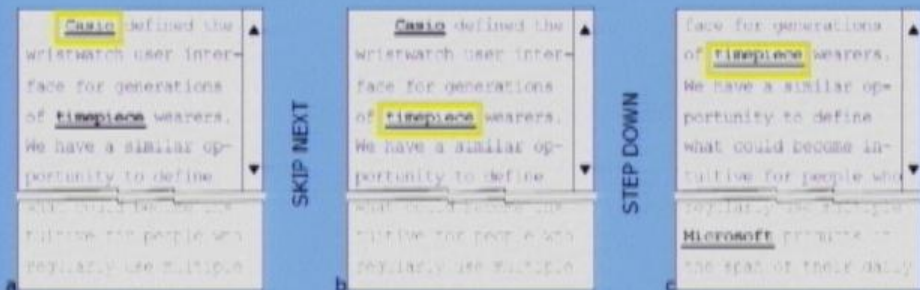
c

01	09	17	25	33
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04	12	20	28	36
05	13	21	29	37
06	14	22	30	38
07	15	23	31	39
08	16	24	32	40

examples:

- » Excel spreadsheet
- » Calendar grid
- » eHome channel lineup
- » Shell file explorer tile view pane

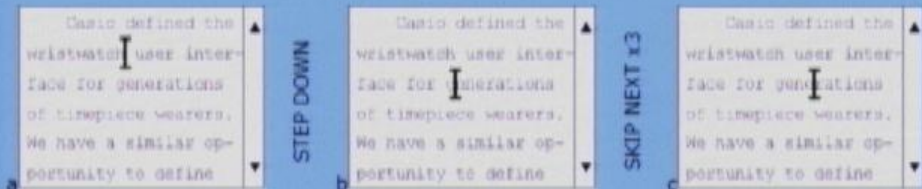
Static Linear Documents



examples:

- » Web page (with hyperlinks & travel history)
- » Outlook message preview pane
- » Word reading mode

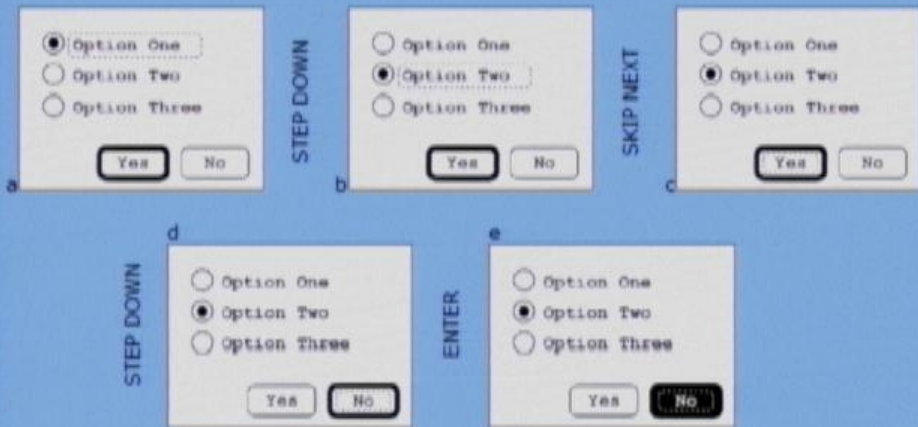
Editable Linear Documents



examples:

- » Word editing mode
- » Outlook message composition

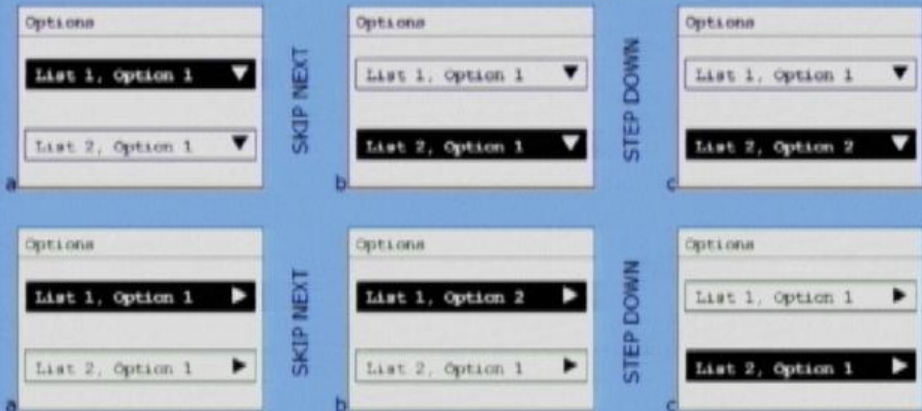
Dialog Boxes & Control Groups



examples:

- » Dialog box w/widget group
- » HTML form
- » Sharepoint page or component set

Spinners & Combo Boxes



examples:

- » Dialog box w/widget group
- » HTML form
- » Sharepoint page or component set

MS Platform Players

- Hardware Innovation Group
- Windows / MSX
- Tablet PC
- Mira
- eHome
- Office
- SPO / Zenith
- Pocket PC / SmartPhone
- MS Hardware

Hardware Development Kit – 100x



Snap-on dogfood
(hardware / software)

- » design
 - » development
 - » testing
 - » evangelism
-
- embodies specification
 - ready late-September

Stewardship & Reference

XEEL Workshops:

- » interaction design review

XEEL Project Site:

- » latest version of spec
- » reference papers
& research reports
- » proto info, drivers, code
- » taskforce contacts
- » component specs
- » archive of communications



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